XLII.—*On some new* Thalassinæ *sent from the Philippines by* M. Jagor, *and on the Systematic Position of that Family.* By Dr. Strahl*.

Scytoleptus serripes, Gerstäcker.

This genus and the single species known to belong to it were established by Gerstäcker from a single mature female specimen. This specimen is from South Africa. M. Jagor has sent a male specimen of this species from Luzon, together with other *Thalassinæ* and *Alphei.* The Zoological Museum of Berlin possesses four more *Scytolepti* brought from Mozambique by Prof. Peters; these also belong to the same species, and two of them are male and two female. From these materials it becomes possible to obtain a more accurate notion of the organization of this genus.

The male individuals are smaller than the females. The cephalothorax of the male from Luzon measures 5 lines (Paris†) in length, the abdomen 10·5 lines, and the tail-fin 2 lines; this gives a total length of 17·5 lines. One of the males from Mozambique has the cephalothorax 8 lines, the abdomen 7, and the tail-fin 3 lines in length, giving a total length of 18 lines; whilst the largest mature females measure more than 2 inches up to nearly 2½ inches in length. The tail-fin is always very long; in one female from Mozambique it is 5 lines in length, whilst the abdomen measures 11 lines. The chelæ of the first pair are unequal in this genus, the right one being usually the stronger; in a male from Mozambique this character is, however, reversed. The fifth pair of feet has no branchiæ; the branchiæ on the others are leaflike.

Callianassa mucronata, n. sp.

Of this species I have unfortunately only one specimen at my disposal; and this is a female, of the maturity of which I am not sure, as there were no eggs under its abdomen. From the extreme projecting point of the forehead to the apex of the tail it measures 13 lines. Although it may be a young state, still it shows such differences that it is certainly a new species. Above all things, the forehead is furnished with a small point projecting between the eye-peduncles to about half the length of the latter. This frontal point is smooth above, and not compressed at the sides. On account of this frontal point, which does not occur in any other known *Callianassa*, I have named the species *mucronata.*

The eye-peduncles are, as usual in the *Callianassæ*, vertically compressed; they run out into a point in front, and bear on the outside the convex and pigmented cornea. The eye-peduncles are of the same length as the first joint of the inner antenna, of which the third joint is as large as the first and second together. The two flagella of these antennæ are nearly of equal length: the external one is obliquely truncated in front, and somewhat bent outwards; on its inside it is furnished with a row of long hairs. The inner flagellum is, as usual, about half as long as the thorax of the animal, and internally fringed with long hairs.

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* From the Monatsbericht der Berl. Akad. December 1861, p. 1055. Translated by W. S. Dallas, F.L.S.

† Throughout this paper the measurements are in Paris lines.

The external antenna bears only a single flagellum; this is nearly twice the length of the thorax. The tuberculum occurs quite on the outer side of its joint, as usual in the genus *Callianassa.* The question whether *Callianassa* does or does not possess anything of the nature of an antennal scale is a peculiar and difficult one. A scale covering a larger or smaller portion of the peduncle of the antenna from above certainly does not occur; and yet the peduncle of the antenna is not three-jointed, but contains more joints. In order to understand this matter, it is necessary to examine more closely than has hitherto been usual into the structure of the antennæ, and especially of the outer pair.

I have already shown that the entire group of the Decapoda are divided into two great sections, according as there is at the base of the external antenna an operculum or a half-ring with the tuberculum. In the *tubercular* Decapods this half-ring is attached to the cephalothorax by means of a hinge-joint, and is slightly moveable. The articulation is effected externally to the carapace, and internally to the outer side of the frontal process of the epistomium. This half-ring, which we will call the *intercalare,* is interpolated into the attachment of the antenna to the cephalothorax: it is immediately followed by a joint, which is the common supporter of the antenna and of the scale, and which I call the *armiger;* this bears the scale externally and the antenna internally, and often possesses a spine, as, for example, in the Lobster and the Cray-fish. In the Lobster, just after its escape from the egg, according to the careful observations of Kröyer, the scale-apparatus and antenna are suspended from a single common ring, but are separate*; the latter is certainly the *intercalare,* although Kröyer does not mention that it bears the tuberculum on its ventral surface. In the Cray-fish, at the same period, the scale-joints and the antennal joints are, as I have noticed, more closely approximated; but it has the *intercalare,* and, even several days before exclusion, a distinct tuberculum. Kröyer calls this piece *pars basilaris,* evidently following Milne-Edwards, who, however, uses the term *article basilaire,* without distinction, sometimes for this piece, sometimes for the first joint of the antenna, and sometimes for parts anchylosed to the latter. For this reason I thought it better not to employ this otherwise suitable word. The structures referable to the scale, or the external branch, according to Kröyer's terminology, consist, according to him, in the embryo Lobster, of two joints, of which that placed nearest to the body is, in my opinion, the *armiger*, whilst the extreme one becomes the scale. At a subsequent period the armiger must approach nearer to the antenna and receive the articulation of the first two antennal joints. In the mature Lobster, at least, the armiger is not a complete ring, but is obliquely cut off on the inside, and open there for the purpose of receiving the articulation of the first two antennal joints; the articulation with the intercalare lies in a direction from above downwards, that is, from the dorsal surface towards the ventral surface; the upper articulation is effected upon the carapace, the lower or ventral one on the anterior margin of the intercalare. The articulating axes of the intercalare and armiger therefore cut each other at a right angle, whilst the articulating axis of the scale lies in the same direction as that of the armiger. The first antennal joint is, then, articulated partly on the intercalare and partly on the armiger. The articulating axis in question is directed from within outwards, and therefore at a right angle to the axis of the articulation between the intercalare and armiger, but in an oblique direction from behind forwards, in such a manner that the inner and posterior condyle articulates with the intercalare, and the outer and anterior one at a considerable distance forwards upon the ventral face of the armiger, near the articulation of the scale. The second antennal joint is articulated both to the first joint and to the armiger; the articulating axis is directed from within outwards; the inner condyle is articulated to the anterior inner angle of the first joint, the outer one to the ventral anterior margin of the armiger, where it is received by a pit, which is situated quite close to the ventral articulation of the scale. This inner condyle is often so peculiarly marked, forming as it were a particular dilatation of the second antennal joint, that it frequently appears to be a separate articulated portion of the skeleton. One is led to this erroneous supposition especially when a true scale is wanting; this piece is then easily mistaken for an aborted scale. This is the case in *Callianassa* (with Leach's *C. subterranea* and the species here described), in *Thalassina scorpionoïdes*, and in Bell's genus *Calocaris*. In the latter the armiger bears externally an acute spine, whilst in the two *Callianassæ* and in the *Thalassinæ* it is unarmed.

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* Hippolyte's Nordiske Acta, p. 43, taf. 6. fig. 134.

The scale-apparatus in the *Thalassinæ* may therefore be so far aborted that the scale becomes small and inconspicuous (*Glaucothoë*, *Axius*) (?), but it may also entirely lose the scale, when the armiger alone makes its appearance. In *Lithodes arctica*, also, which, however, does not belong to this group, it may be mentioned in passing, only the armiger exists.

To complete the account of the relations of the individual antennal joints, I will add here that the articulating axis of the third joint is again directed from above downwards, and therefore cuts that of the second antennal joint at a right angle. This relation of the articulating axes also occurs elsewhere: for example, in the chelæ of *Lupa*, *Platycarcinus*, &c., the articulating axes between the *brachium*, *carpus*, and *manus* each form a right angle with that of the next joint. But a peculiarity of the articulations of the antennæ is, that on the bent side, in the soft chitinous tissue of the joint close to the sinew of the flexor muscles, there is a sac, into which it is probable that a portion of the articular skin folds itself during flexure. This character is important in determining whether a joint belongs to the antenna or the flagellum. My investigations in this direction show that both the outer and inner antennæ always consist of three joints, as has already been asserted by Kröyer as a result of the embryology. Accordingly the outer antennæ of the *Scyllaridæ* is by no means four-jointed, as is generally supposed; it is only three-jointed, as in the allied *Palinuridæ*. The joint supposed to be the fourth joint does not exhibit the peculiar articulation of an antennal joint, and is therefore a flagellar joint. The *Palinuridæ*, consequently, have a many-jointed flagellum on the outer antenna; the *Scyllaridæ* a one-jointed flagellum only.

The joints of the antennæ of *Callianassa mucronata* are not all of equal length; the first joint is the shortest; the second and third are each nearly twice as long.

The external maxillipeds are opercular, without palpi. The first pair of feet is torn away; the second is didactyle. The last joints of the posterior ambulatory feet are beset with strong stiff hairs more abundantly than in *C. uncinata*. The abdomen exhibits no peculiarities; the central tail-fin is rectangular, broader than long; the lateral appendages, on the contrary, are longer, and form a wide-spread fan. The abdominal feet resemble those of *C. uncinata*.

In company with the specimens just described there is a smaller one, about 5 lines in length, the characteristic frontal point of which shows that it belongs to the same species. It possesses the first pair of feet; and from this we may fill up the gap. This pair of feet bears chelæ, and is the strongest of all; the left foot is stronger than the right one. The hand is hairy, but the brachium is smooth, slender, and destitute of hooks at its inferior sharp margin. The fingers are acute, about as long as the hand, which is nowhere granular or tubercular. The margin of the fingers is finely denticulated at the base.

Axius plectrorhynchus, n. sp.

The only species of this genus hitherto known, *Axius stirhynchus*, is European: the species now to be described has been sent from Luzon by M. Jagor: it is represented, unfortunately, only by a single female specimen; but this is sexually mature. It measures about 9 lines in length.

The cephalothorax is laterally compressed and quite unarmed; it has posteriorly an emargination for the reception of the abdomen; on each side of this emargination there is a small process for the reception of the articulation of the first abdominal segment; the frontal rostrum, which is not laterally compressed, is not acute, but terminates in two small points, which lie close together side by side, and are a little turned up in front; the two lateral margins of this process, which gradually approach anteriorly, are each armed with four similar, small, slightly turned-up points (the apical points being included). On each side, near the frontal process, there is a similar spine, which projects in the middle above the eye-peduncle. In the middle of the base of the frontal process, at the commencement of the stomachal region, there stands another equally small and similarly formed spine; so that the forehead bears eleven spines in all.

The eye-peduncles are cylindrical and but small, not reaching quite to the apex of the frontal rostrum; a little before the commencement of the cornea they are somewhat constricted, and then swell out again into a globular form, as in *Gebia littoralis*.

The inner antennæ are cylindrical, and have two flagella; the junction of the second and third joints reaches to the apex of the rostrum; the first joint is the longest, as long as the second and third together. The anterior extremities of the joints are beset with a few hairs. The two flagella are nearly of equal length, about half as long as the carapace. The external antenna has only one flagellum, which is about as long as the carapace. The tuberculum is placed about in the middle of its proper piece. The first antennal joint is the shortest of the three; it bears a spine on the inside in front, and reaches as far forwards as the piece which lies on the outside of it, the armiger, which emits forwards and outwards, near the second joint of the antenna, two horizontal approximated points, of which the inner may perhaps be the scale: from the smallness of the object, and the necessity of handling the unique specimen with care, I found it impossible to decide whether this inner point is moveable. It is probable that the inner point is moveable, but the outer one is not; consequently the outer point belongs to the armiger, but the inner may be the true scale. Both points, however, are of equal length; the inner one retains the same width for about two-thirds of its length, then narrows, gradually becoming round, and runs on in its last third into a fine point; the outer one, on the contrary, runs gradually and uniformly to a point. The second antennal joint is the longest, and projects a little beyond the two points just mentioned. The outer maxillipeds are foot-like; close to them externally is a palpus with a long flagellum. The branchiæ are in tufts, but the fifth pair of feet bears no branchiæ.

Of the two pairs of chelæ the first is the strongest, and the two legs are of equal length and strength. The hands are laterally compressed, with the upper and lower margins rounded off; the fingers are acute, half as long as the hand; the carpus is triangular, that is to say, the anterior and posterior (articular) margins meet below in an obtuse angle; the upper margin, or third side, however, is not straight, but convex superiorly. The second pair of chelæ is of about the strength of the posterior ambulatory feet; the hand, including the fingers, is of the same length as the carpus; the latter is broader in front than behind. The fifth pair of feet is thinner than the third and fourth. The claw-joint is of the same strength as the rest.

The abdomen, like all the rest of the body and its members, is quite smooth and naked; the tufts of hair on the sides of the abdominal segments, which distinguish *Axius stirhynchus*, are wanting. The lateral appendages of the abdominal segments are but short. The first segment is narrow; the segments gradually increase in length up to the sixth: the caudal scale, again, is smaller, broadly truncated behind; the lateral appendages belonging to it, especially the outer ones, are long. When these parts of the tail-fin are spread out like a fan, their outline is the same as that of the caudal scale. The abdominal appendages on the first segment are simple; the following ones consist of a basal joint, from which two broad, feathered, pointed laminæ, equal in length and breadth, are suspended; the inner one has also a stalk-like process on its inner margin.

Gebia barbata, n. sp.

This new species is likewise a native of Luzon. Sexually mature examples are about 1 Paris inch in length.

The forehead is perpendicularly truncated in front, as in *G. major*, De Haan, so that it does not terminate in a point, as in *G. littoralis*, Risso; it is densely clothed with short hairs, and projects but little beyond the eye-peduncles. The latter present nothing remarkable; they lie upon the first, dilated, slightly convex joint of the inner antennæ, and extend as far as the second joint. The forehead, the second joint of the inner antennæ, and the first joint of the outer ones all project the same distance forward. The three joints of the inner antennæ are all nearly of the same length; the flagellum is double, the outer one is somewhat stronger and a little shorter than the inner one—at the utmost, of the length of the thorax. The latter is straightly truncated behind; its lateral parts extend further backwards.

As regards the clothing of many parts with hair, our species resembles *G. major*, but it is smaller (*G. major* attains a length of 3 inches 7 lines) and still more abundantly clothed with hair, whence the specific name. The second joint of the outer antenna is the longest of the three, and exhibits a densely bearded line on its outer side, running obliquely, from above and behind, downwards and forwards, which gives this joint a most deceptive appearance of consisting of two joints. The first joint is armed with a spine at its inner anterior angle. This antenna only bears one flagellum, and this is of half the length of the animal. There is no trace of a scale-apparatus. The tuberculum is situated, not as in *G. littoralis*, in the middle of the ventral surface of the intercalare, but more outwardly.

The external maxillipeds are foot-like; their palpus is of the length of the second joint, and its flagellum scarcely reaches beyond the third joint. In *G. littoralis*, Risso, the palpus bears no flagellum.

The first pair of feet is subcheliform, in accordance with the generic character; the hand is furnished on the outside with a row of dense long hairs, running obliquely, from above and behind, downwards and forwards. The first three pairs of feet are strongly beset with long hairs on their lower and inner sides. The fifth pair of feet is different from the rest, and nearly subcheliform; the immoveable finger is but small and weak. This pair of feet bears no branchiæ; the branchiæ on the others are tufted. The femoral joints present a spine on the upper edge at the distal extremity.

The abdomen is at first slender, but gradually becomes broader and thicker. There are no abdominal feet on the first segment in the male. From the second segment onwards two oval fringed appendages are suspended from a short peduncle; of these, the inner one is smaller than the outer; neither of them bears a filamentous appendage. The caudal fan consists of a nearly square central piece, of which the posterior margin has a fine and short fringe. Upon this piece there is no central ridge, but there are two lateral ridges running near and parallel to the margins, and united by a transverse ridge which runs near the articular margin. The lateral appendages are fringed all round; the inner one exhibits a central ridge, and the outer one two slightly bent faint lines on the outer half.

The subcheliform fifth pair of feet connects this species with Audouin's *Gebia stellata* in the text to Savigny's 'Description de l'Egypte.' Judging from the forehead, indeed (with regard to its projection and denticulation), the latter might be either a *Gebia* or an *Axius*; but the scale is wanting on its external antennæ, and therefore it can be approximated only to *Gebia*. The admirable figure on the tenth plate, however, shows us that this *Gebia stellata* cannot be a *Gebia* at all, but that it must form a new genus. Audouin has not given a description of the Crustacean in question; I will therefore give one here from the figure, under the name of

CALLIADNE, nov. gen.

To the species figured I give the name of *C. Savignii*. The cephalothorax exhibits in front only a small rounded frontal process, which is finely pointed in the median line, but is separated laterally by gentle sinuosities from the projecting lateral ridges, which bound the epigastral region on the sides. These ridges are beset with a row of fine teeth directed forwards, and run in the furrow which bounds the epigastral region. This region is smooth posteriorly; the larger anterior part, as far as it is bounded laterally by the denticulated ridges, and including the frontal process, is densely covered with fine teeth obliquely directed forwards. These teeth, however, are symmetrically distributed in five series, in such a way that one series exactly occupies the median line, and on each side of this two rows are placed at an equal distance between it and the lateral ridges. This structure of the forehead removes this genus more from *Gebia* than De Haan's *Laomedia*, with which our genus is probably most nearly allied on account of the cheliform first pair of feet. I must remark here that Dana's diagnosis of the genus *Laomedia*, in as far as it represents the *pedes quinti* as *obsoleti*, is founded upon a misapprehension of De Haan's statements. De Haan says, *pedes quinti desunt*; that is to say, in the example before him they had been destroyed, as may be seen distinctly from the figure of it given by him. If we had any knowledge of the fifth pair of feet in *Laomedia*, we should know with more certainty whether *Calliadne* and *Laomedia* should remain separate or be brought together in one genus.

The antennæ and the first two pairs of feet of *Calliadne* are richly clothed with long hairs on their lower surface. The joints of the inner antenna are very unequal in length: the first joint is the longest, and the second the shortest; the first joint is as long as the second and third together, and the third twice as long as the second. This antenna bears two flagella, of which the shorter inner one is as long as the antennal peduncle, and thicker than the other, and terminates in a rounded and almost clublike form. The outer flagellum is longer, more slender and acute.

The outer antenna possesses no scale. *Gebia*, *Laomedia*, and *Calliadne* therefore group themselves closely together. The flagellum is simple and of the length of the thorax.

The total length of the animal is 7 lines; but unfortunately we have no information as to whether it was perfectly developed.

The outer maxillipeds are foot-like; the outer palpus has a peduncle which is not quite so long as the second joint of the maxilliped, and it terminates in a multiarticulate flagellum.

The first pair of feet is cheliferous. The hand, which is thinly clothed with hairs all over, is laterally compressed, yet the upper margin is not sharp or keeled, but rounded; the carpus is longer than the fingers, and the fingers are acute. The first pair of feet is the longest, measuring about two-thirds of the total length of the animal. The following feet are monodactyle, slender, thinner than the first pair; they become shorter the further back they are situated, but the fifth pair becomes again not only longer, but also subcheliform.

The abdomen is at first slender, but becomes broader towards the middle, and then again diminishes somewhat in breadth. The abdominal feet of the first segment are simple, thin, and rudimentary; those of the following segments bear two appendages, of which the outer is large, long, and ciliated all round, but bears no filiform process; the inner one, on the contrary, is small, only a fourth or fifth of the size of the outer one, but also ciliated all round.

The caudal fan consists of a broad, rounded, central piece, which is of the same length with the lateral appendages; the latter are broad; and all are ciliated on the margins.

With regard to the characters of the sternum and of the tubercle on the intercalare, the figures give us no information. The other affinities to the *Thalassinæ*, however, allow us to suppose that there are no differences in these parts.

Even Latreille united the genera known to him of the families *Astacinæ* and *Thalassinæ* subsequently established by Milne-Edwards, and De Haan contributed evidence in support of this union from their organization. The numerous *Astaci* which were afterwards made known induced Erichson to separate three distinct genera from *Astacus*: these in various ways constituted a transition from the genus *Astacus* to the *Thalassinæ*. The union of the *Astacinæ* and *Thalassinæ* has been approved of by some naturalists, for example by Gerstäcker in his Carcinological Contributions in Wiegmann's 'Archiv' for 1856; but it has been rejected by Dana in his great work on the Crustacea. Dana has united the *Astacidæ* with the *Scyllaridæ* and *Palinuridæ*, whilst Milne-Edwards has placed the *Thalassinæ* between them. In fact, however, the *Astacidæ* have much less affinity to the *Scyllaridæ* and *Palinuridæ* than to the *Thalassinæ*. The want of the antennal scale does not sharply divide the *Astacidæ* from the *Thalassinæ*, inasmuch as there are *Thalassinæ* which exhibit traces of this organ, although but insignificant ones. Of *Thalassinæ* which possess a more or less perfect antennal scale, there are, besides *Glaucothoë* (Milne-Edwards) and *Axius* (Leach), also *Calocaris* (Bell) and even, notwithstanding the express denial of Milne-Edwards, probably the genus *Callianassa*—at least *Callianassa subterranea* (Leach) and *C. mucronata* (mihi) and *Thalassina scorpionoïdes*. In the atlas to Cuvier's 'Règne Animal,' pl. 48, Milne-Edwards has given a figure of *Callianassa*, and in the further details of the organization has even perfectly and accurately represented the external antennæ; but as he had not recognized the more delicate details, the figure is deficient in this respect. The *Scyllaridæ* and *Palinuridæ* never have an antennal scale, and this alone would separate them more sharply than the *Thalassinæ* from the *Astacidæ* sensu stricto. But, in respect to the outer antennæ, the *Scyllaridæ* and *Palinuridæ* exhibit a character which is perfectly foreign not only to the *Astacidæ*, but also to the *Caridæ*, *Penæidæ*, &c. In them, namely, the elsewhere moveably articulated piece, which bears the tubercle and the perforated tympanic membrane contained in it, is intimately anchylosed to the epistomium: on account of this anatomical character, they must form a separate section of the Tubercular Decapods, repeating in a certain degree the Oxyrhynchid type of the Opercular Decapods. This anchylosis appears to occur very early; for, from the numerous observations of Coste and Couch, it is now scarcely doubtful that the *Phyllosomata*, still retained by Milne-Edwards as a peculiar genus, are the early stages of the *Palinuri*. The Zoological Museum of Berlin possesses a series of *Phyllosomata*, about sixteen in number, taken by M. Jagor in one sweep of the towing-net, in the open sea near Trinidad; these show such gradual changes in course of growth that thirteen of them may be arranged in such a manner as to demonstrate the increasing size and simultaneous alteration of the characters most evidently. As, however, these are remarkable in other respects likewise, I must put off more detailed statements for the present, and will only mention here that even these phenomena of growth are greatly in favour of the *Phyllosomata* being the young state of some Podophthalmatous Crustacean. In all the above-mentioned *Phyllosomata*, and in the other specimens contained in the Berlin collection, I have succeeded in confirming Kröyer's observation as to the presence and position of the auditory vesicle. What Gegenbaur and Leuckart have sought in vain in fresh examples may be easily seen in spirit-specimens: the coagulation effected by the alcohol probably facilitates the detection of contours which, under other circumstances, are too delicate. Moreover, the *Phyllosomata* already possess the tuberculum; at least, this was what I considered to be the nature of a tubercle, situated close to the outer antenna. The outer antenna here is destitute of any indication of an antennal scale; and this would also be in favour of its belonging to *Palinurus*. I could not make out that the elevation considered by me as the *tuberculum* was situated on a separately articulated piece; and it would likewise constitute an agreement with the *Palinuri* that the tubercle was placed in front of the mouth upon the anterior segment, which is undivided and bears the eyes and the two antennæ*.

The position of the auditory vesicles is surprising: they are situated within the brain, and occur elsewhere in the first joint of the inner antennæ. During further growth, the auditory vesicles must push forward, and, changing their form, get into the first joint of the inner antennæ, and open themselves; whilst, on the contrary, the *tubercula* move nearer to the mouth and more towards the median line. But this must be cleared up by further observations.

In the vicinity of the elevation regarded by me as the tuberculum, and not far behind it, there is, in the interior, in front of the fan-like liver, a peculiar mass, the external contours of which, resembling convolutions of tubes, lead to the conclusion that it is a glandular organ. To this mass some filaments run from the brain; it is paler in front, darker behind. This is probably Suckow's gland, which always consists of two differently tinted portions.

From the above it appears distinctly that the *Scyllaridæ* and *Palinuridæ* are not more nearly allied to the *Thalassinæ* and *Astacinæ* than to the *Palæmones*, *Penæi*, &c. We have now to ascertain wherein consists the near affinity of the *Astacinæ* and *Thalassinæ*. In the first place, the scale of the external antennæ, which is wanting in some genera, rudimentary in others, and in others, again, more highly developed, but never attaining to the

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* Perhaps the *Phyllosomata* of which Milne-Edwards says that their antennæ are "*lamelleuses*" may belong to some Scyllaride.

development found in the *Carides*, must be left quite out of the question as a variable character. But there are other agreements in the outer antenna. Thus, in the *Astacinæ* and *Thalassinæ* the tuberculum is never turned inwards towards the median line of the body, as in the *Carides*, &c., but is always either in the midst of the ventral surface of the intercalare, or even turned quite outwards (*Callianassa*). The same character is presented by the *Paguridæ*, which also agree with the *Thalassinæ* and *Astacinæ* in the fact that their thoracic segments are not firmly anchylosed together. *Homarus* forms an exception to this: it probably constitutes the transition to the *Carides*, &c., or the separation of its last thoracic segment is an embryonic character. Whilst the other *Astacinæ* group their thoracic segments 4 : 1, the *Paguridæ* group them 3 : 1 : 1. The *Paguridæ* have antennal scales; in the *Thalassinæ* these disappear. We have therefore in these families a group which is sharply differentiated from all other Tubercular Decapods, and, by virtue of the separation of their thoracic segments, form the most decided transition to the *Squillidæ*. Taking into consideration certain appendages of the abdominal segments of *Callianidea* and *Callisea*, which are usually identified with the respiratory organs of the *Squillidæ*, the transition is much more evident.

I place the above-mentioned families as an order amongst the Tubercular Decapods, and name them *Externa*, on account of the more external position of the tuberculum, which is their general character; opposite to them I place the rest as *Interna*, but would arrange the latter first and the former second, with the *Squillidæ* following them.

The *Externa* are cylindrical, or at the utmost somewhat laterally compressed; either they have the thoracic segments (anchylosed) 3 : 1 : 1, an antennal scale, the abdomen chiefly membranous without lateral appendages, and the inner antennæ distinguished by two flagella very different both in size and in their general nature (*Paguridæ*); or the thoracic segments are (anchylosed) 4 : 1 (5 only in *Homarus*), the antennæ present either a distinct or rudimentary scale, or none at all, the abdomen consists of calcified segments with lateral appendages, and the inner antennæ bear two not remarkably dissimilar flagella (*Astacinæ* and *Thalassinæ*).

The *Galatheidæ* and *Ægleidæ* certainly approach most closely as regards the characters of their thoracic segments (4 : 1); but they are *Interna*, have no antennal scale, possess a vertically compressed body, and form with the *Porcellanæ* a well-marked group.

The objection that the *Paguridæ* have quite a different developmental history—the *Paguri*, according to Rathke and Philippi, escaping from the egg in the form of *Zoëa*—is not very difficult to answer; for the above-mentioned observers state particularly that the *Zoëæ* observed by them had something very peculiar about them, namely, the scale on the outer antenna. Philippi even figures this; and the peculiarity of the *Paguridæ* is that the thoracic legs are only subsequently developed, just like the appendages of the abdomen. In the subsequent development, the legs appear no longer to occur with two rami; at least, Rathke says nothing decisive upon this point, although he particularly states, with regard to the maxillipeds, that these are biramose.

Upon *Galatea rugosa* Rathke says but little. Its mature embryos agree in structure with those of *Pagurus*. But here our first question would be, whether these embryos have a scale on the outer antenna, this being absent in the perfectly developed animal. From the materials available to us, which indeed are but scanty, it appears as if the mature embryos did not differ essentially from the fully developed animals in respect of the organization of the eyes and of the outer and inner antennæ. That during development definite lower forms must be passed through does not appear to be the rule among the Crustacea. I am only acquainted with one instance which is in favour of it. Milne-Edwards states that he has observed that, in mature embryos of *Naxia serpulifera*, the first joint of the outer antenna is not anchylosed with the surrounding parts, but still exists separately (Annales des Sciences Nat. 2 sér. iii. p. 331). From this we should expect to find something similar in the *Palinuridæ* and *Scyllaridæ*. But if the *Phyllosomata* be their larvæ, we must again hesitate, from what is stated above, before setting up Milne-Edwards's observation as a rule.

As above mentioned, the *Thalassinæ* and *Astacinæ* are not much compressed laterally, at least not in the same degree as many *Palæmones*, and especially the *Penæidæ*; by this means it is of course possible that the sternum may become developed to a greater breadth. Many of the forms belonging here want the appendages of the first abdominal segment which act as external male sexual organs. According to Thomson, the copulation of these also takes place in a peculiar manner. Perhaps, in connexion with this, the sternum of the female is constructed differently from that of the male. Not only are the sternal plates of the fourth thoracic segment considerably larger, as is likewise the case even in the male, but also those of the third segment, and consequently a peculiar way is established from the female sexual orifices towards the abdomen.

I have seen this in *Cambarus, Engæus, Axius, Gebia, Calocaris, Callianassa,* and *Thalassina*; and it occurs, no doubt, in all

Thalassinæ. I have not yet examined the *Paguridæ* in this direction. Nowhere else am I acquainted with a similar structure of the sternum, except in a *Penæus* from Manilla, the female of which presents a peculiar soft structure on the fifth segment of the thorax. This is a round, chitinous, but uncalcified disk, which bears an elevated ridge in the middle, running from before backwards, the whole length of which is deeply slit, but in such a way that its lips close tightly. The function of this organ is quite enigmatical, and nothing analogous to it is known in other *Penæi.*

XLIII.—*Contributions to an Insect Fauna of the Amazon Valley.* COLEOPTERA : LONGICORNES. By H. W. BATES, Esq.

[Continued from p. 124.]

Genus STEIRASTOMA, Serv.

Serville, Ann. Soc. Ent. Fr. iv. 24.

This is a well-defined genus, not very closely allied to any of the preceding. Its nearest relationship seems to be with those species of *Acanthoderes* which have slender fore tibiæ, rounded anterior acetabula, and closed acetabular sutures, tricarinate thorax, and prominent centro-basal ridges continuing as smooth carinæ to the apex of the elytra. It differs, however, from *Acanthoderes* in the complex tuberculation of the sides of the thorax. Instead of a simple lateral conical tubercle or spine, as is usual in the Longicorn family, the thorax presents, on each side, an irregular prominence furnished with three tubercles. In some species this prominence is very strongly developed, and then two of the tubercles are carried to the apex, giving it a bifid appearance, the third remaining at the base beneath. All the species have, besides this tricuspid prominence, an acute tubercle on each side near the fore margin of the thorax; and some present, in addition to this, a similar pointed wart on the side, some distance above it. The muzzle, although similar in shape to that of *A. bivitta,* is considerably longer and more broadened anteriorly than in any species of *Acanthoderes,* and the fore angles are more strongly pronounced. The mandibles are long, very slightly bowed, and much flattened. The centro-basal ridges of the elytra are curved outwards and prolonged behind as more or less flexuous smooth keels to the apex. In the males of some species the basal joint of the antennæ forms an irregular many-angled club, and is longer in proportion to the third than is the rule in the section to which the genus belongs.